High-tech bubbles, technology diffusion, and how to prepare for the next techno-mania

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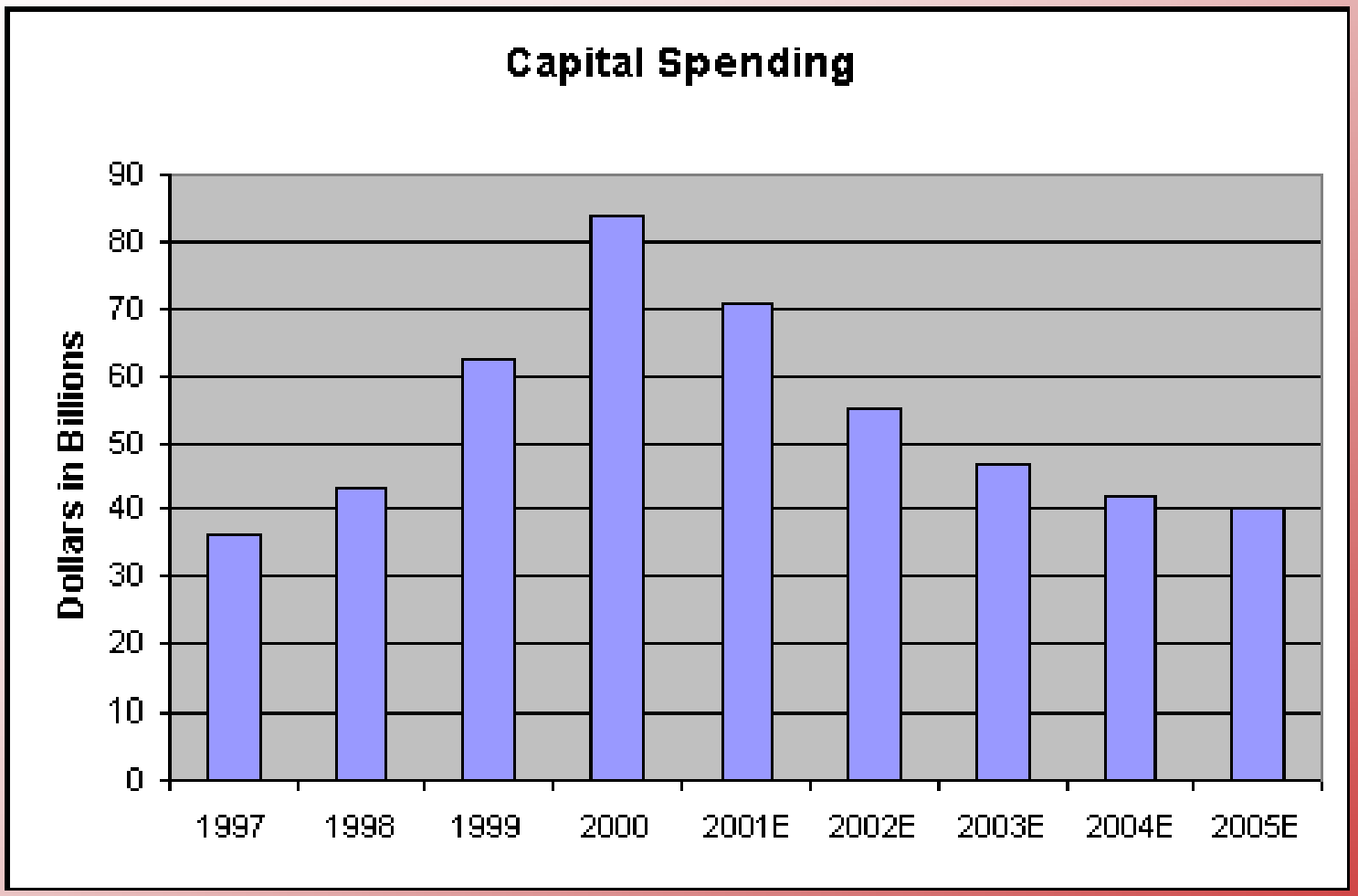
US telecom industry

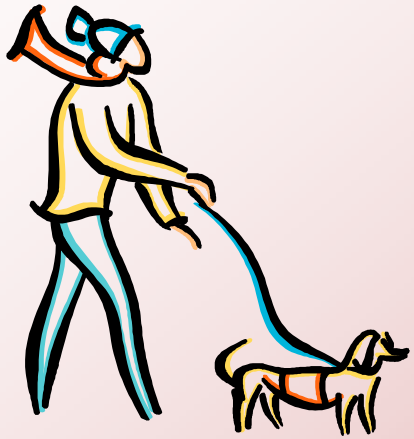


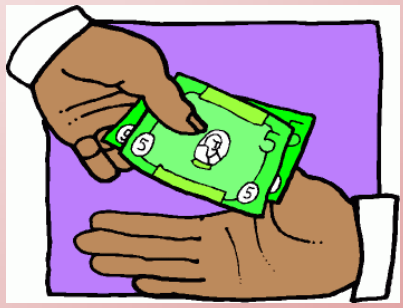
Source: Light Reading

Outline:

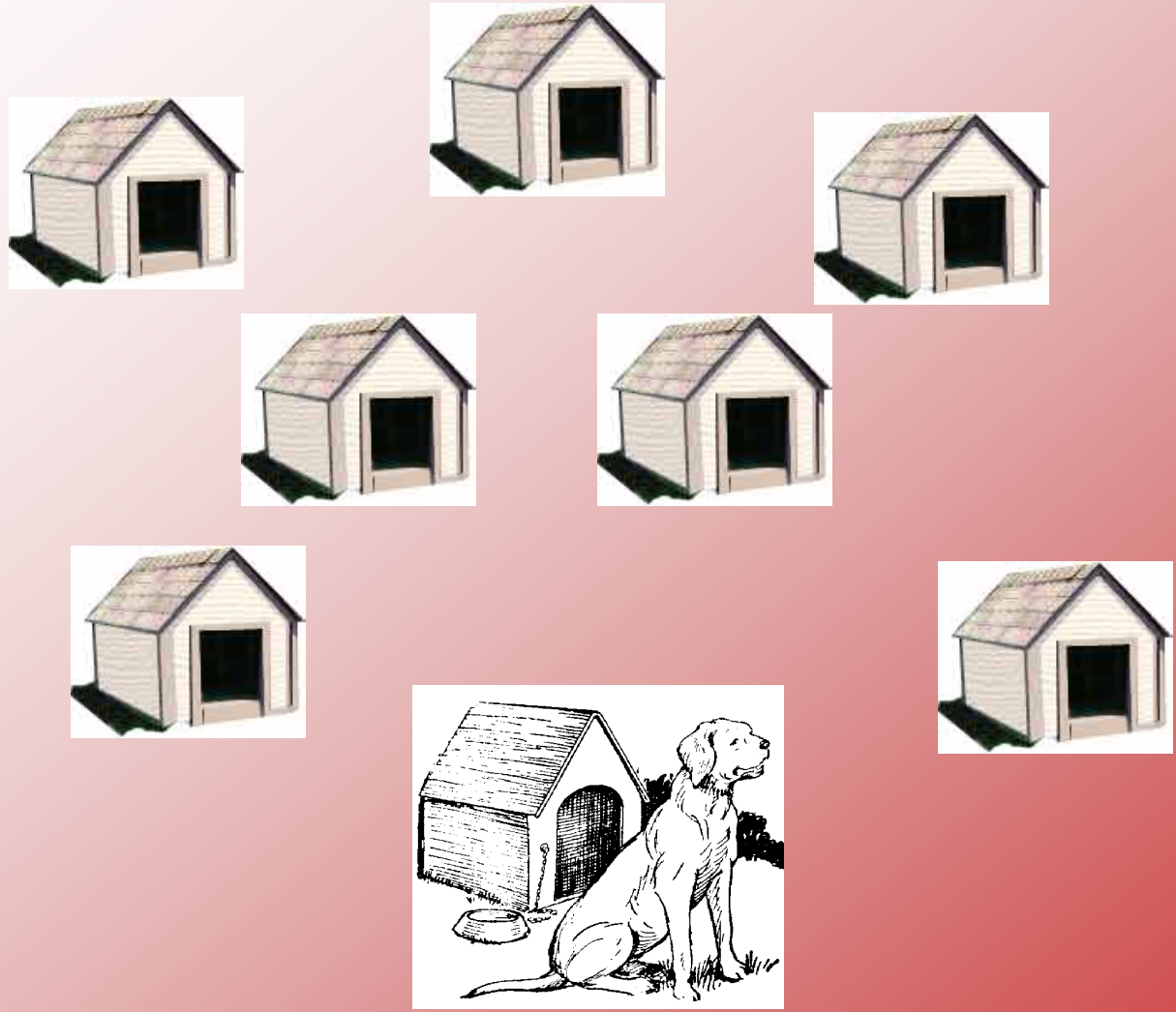
- technology predictions inherently hard
- techno-manias rooted in human mass psychology, ignited by appearance of promising new technologies
- several common patterns in techno-manias
  - mantras such as “Internet time,” ...
  - willing suspension of disbelief
- a few techno-bubbles can be identified as such
- identification of future techno-bubbles may become even harder than in the past

Financial bubble





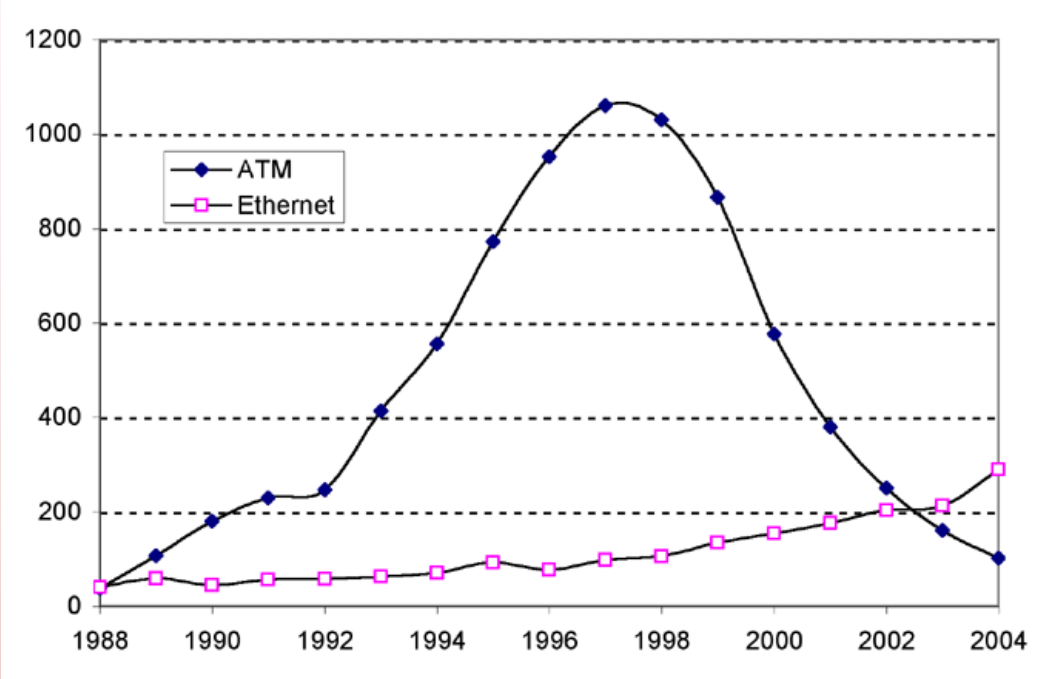
Real investment bubble



Difficulty in technology predictions:

- overestimates (as with dot-coms and telecoms) and underestimates (as with cellular and computers) very common
- prediction of technology hard, of human reaction far harder
- some patterns (Moore's Law, learning curve)
- contrarian approaches do pay off occasionally
  - experts often unaware of technology's real attraction

Frequent misplaced bets on technologies:



Number of papers per year with ATM or Ethernet in the abstract, data from *IEEE Xplore* (2004) (estimated values for 2004).

Kalevi Kilkki, Sensible design principles for new networks and services, First Monday, Jan. 2005, http://www.firstmonday.org/issues/issue10_1/kilkki

Overwhelming need for flexibility in technology and business plans:

The goals of the advertising business model do not always correspond to providing quality search to users. ... we expect that adertising funded search engines will be inherently biased towards the advertisers and away from the needs of the consumers. ... But we believe the issue of advertising causes enough mixed incentives that it is crucial to have a competitive search engine that is transparent and in the academic realm.

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Sergey Brin and Larry Page, 1998

Widespread claims that bubbles cannot be identified:

Advocates of bubbles would probably be forced to admit that it is difficult or impossible to identify any particular episode conclusively as a bubble, even after the fact.

B. Bernanke and M. Gertler, 1999

Widespread claims that bubbles cannot be identified:

FALSE!

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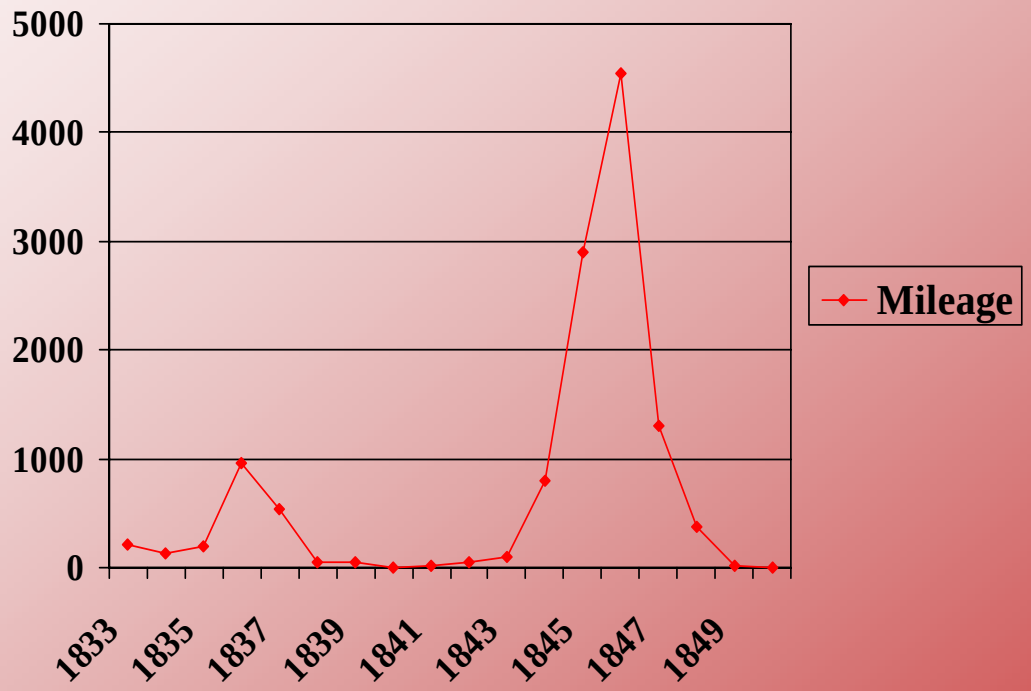
Long history of technology leading to overinvestment and crashes:

Railways authorized by British Parliament (not necessarily built)



Key mistakes of railway and Internet bubbles:

- “railroad time”
- “Internet time”

Internet time is a dangerous myth!

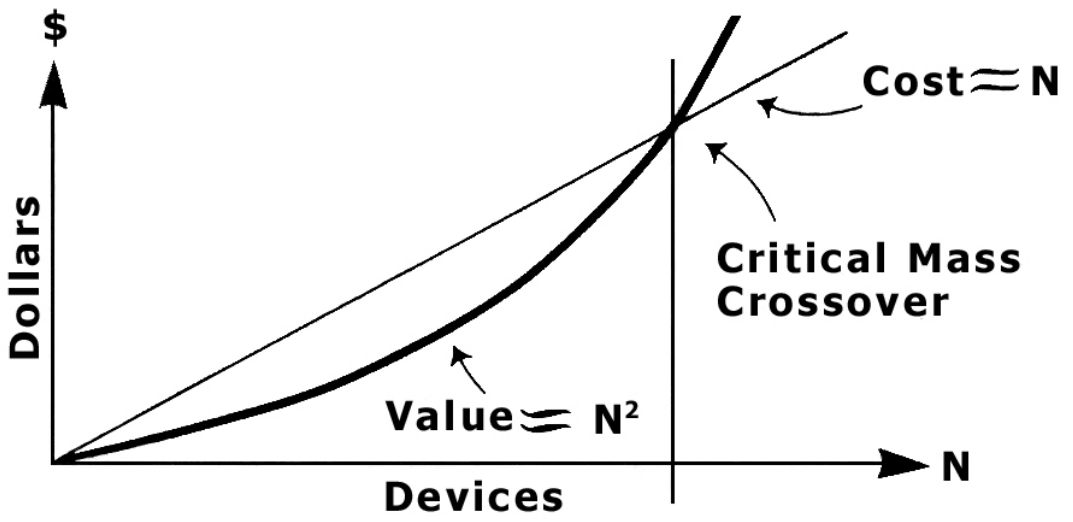
A modern maxim says: “People tend to overestimate what can be done in one year and underestimate what can be done in five or ten years.”

J. C. R. Licklider
“Libraries of the Future,” 1965

Important exceptions: forcing agents (and browser)

Metcalfe's Law:

The Systemic Value of Compatibly Communicating Devices Grows as the Square of Their Number:



Corrected version of Metcalfe's Law:

Value of communication network of size n grows like n log(n)

Sarnoff's Law: Value of content delivery network grows like n

Network effects present, but not as powerful as expected

“Field of dreams” mantra

If you build it, they will come

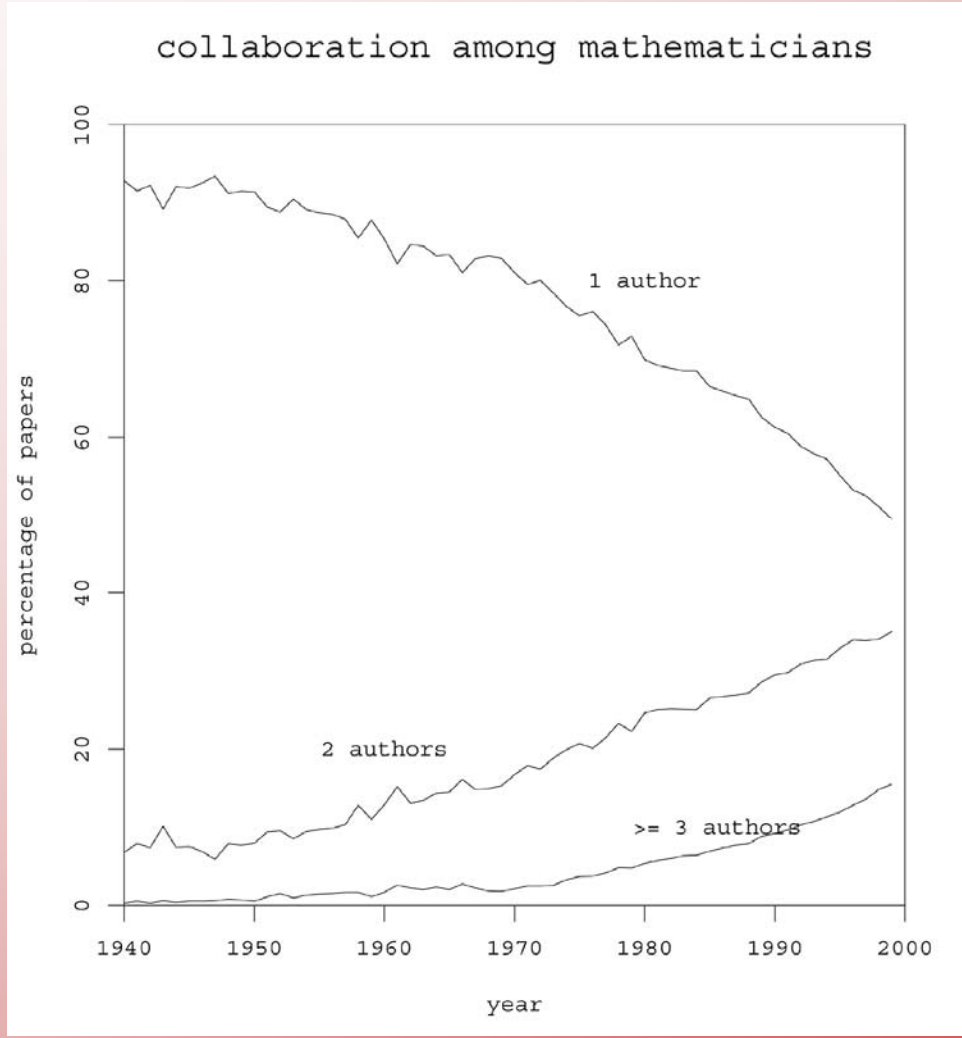
Internet bubble mantra

If you build it, they will come instantly

A realistic mantra

If you build it, they may come, but in their own sweet time (and will do things you didn't expect).

Rate of change:



Willing suspension of disbelief:

- British Railway Mania of the 1840s: The Glenmutchkin Railway story
  http://www.bygosh.com/Features/2004/08/glenmutchkin.htm
- Internet bubble of the late 1990s: Mike O'Dell (UUNET/WorldCom) presentation
  http://stanford-online.stanford.edu/optic/main.html

One was aimed at discouraging speculators through satire, and failed miserably, the other was aimed at encouraging crazy overinvestment, and succeeded brilliantly

Failures of telecom bubble and British Railway Mania of the 1840s:

fundamental lack of demand

- telecom bubble: 10x annual growth presentations by John Sidgmore and Mike O'Dell (UUNET/WorldCom) http://stanford-online.stanford.edu/optic/main.html
- British Railway Mania:

Between 1837 and 1845 inclusive, there were gentlemen who rode in their carriages and kept fine establishments, who were called 'traffic takers'. He stumbled over one of these gentlemen in 1844, who was sent to take the traffic on a railway called the Manchester and Southampton. It did not go to Manchester and it did not go to Southampton; but it was certainly an intermediate link between these places. This gentleman went to a place in Wilts where there was a fair, and there took the number of sheep on the fair day, and assuming that there would be the same number all the days of the year, he doubled or trebled the amount for what he called 'development' and the result was that he calculated that by sheep alone the Manchester and Southampton line would pay 15 percent.

Edward Watkin, 1868

Failures of telecom bubble and British Railway Mania of the 1840s (cont'd):

- Sidgmore and O'Dell claims preposterous, obviously false
- 'traffic takers' case much more ambiguous, still being investigated (but lack of demand should have been obvious)

Most popular explanation: corruption

- Internet bubble: “Those in positions to notice were paid a lot not to notice”

- British Railway Mania of the 1840s: Herbert Spencer, “Railway morals and railway policy,” 1854

But not full story, as there were influential opponents of Railway Mania:

The Times

The Economist

James Morrison, MP

Differences between Internet bubble and British Railway Mania:

- concrete railroads vs. invisible photons, mind share, monetizing eyeballs, ...
- far more information available today, but also far more misinformation, and problems dealing with information overload
- “hype makes reality”

Conclusions:

- technology predictions inherently hard
- expect more techno-manias, possibly soon
- expect more leaders such as Bernie Ebbers, once acclaimed as technology visionary, later defending himself on the grounds that he he didn't "know about technology," and didn't "know about finance and accounting."
- some techno-bubbles can be identified as such beforehand

Further data, discussions, and speculations in papers and presentation decks at:

http://www.dtc.umn.edu/~odlyzko